**CPT\_S 534 HW2**

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**Q1. Use the equality of discriminants to derive a quadratic equation for Bayes’ discriminant points in a 1D, 2-class problem with Gaussian class likelihoods**

The curves of C1 and C2 intersects when g1(x) = g2(x).

Where , and = = 0.5 since priors are equal.

Thus,

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,

,

Finally,

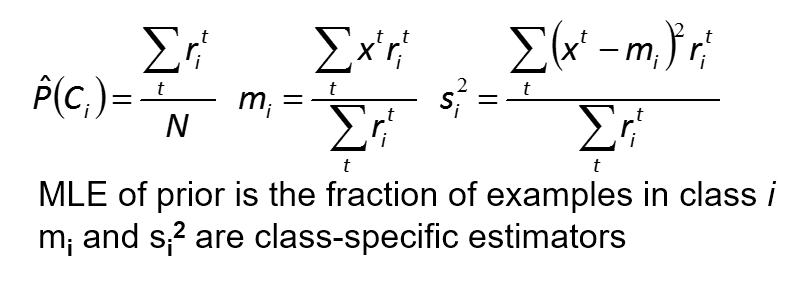
,

**Q2. Mean and variance of C1 class likelihood are 3 and 1, respectively. Mean and variance of C2 class likelihood are 2 and 0.3, respectively. Assume priors are equal, with a sample size of 100, compare the MLE estimators to the true means and variances.**

Data set:

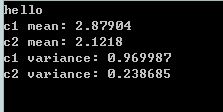


Write C++ code based on the equations:





Output Result:



(Real Mean and Variance for C1: 3, 1,

Real Mean and Variance for C1: 2, 0.3)

The MLE estimators of mean and variance calculated are similar compared to real mean and variance.

**Q3. For the same sample, compare Bayes’ discriminant points calculated from MLE estimators with those derived from the true means and variances.**

Equation from Q1:

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Substitutes (s1, s2, m1, m2) with (sqrt(1), sqrt(0.3), 3, 2) respectively,

We got:

Solve it for x,

Again, substitutes (s1, s2, m1, m2) with (sqrt(0.97), sqrt(0.24), 2.88, 2.12) respectively

We got:

Solve it for x,

Looking at the results above, one root is similar between real and MLE, the other root is quite different.